

Introduction

- In the present economy, many natural resources are becoming scarce while on the other hand, waste disposal is increasingly causing negative effects on the quality of our environment.
- Organic waste – such as manure, sewage sludge and food waste – contains many valuable nutrients which can be recovered and re-used to close the nutrient cycle. SYSTEMIC facilitates the transition towards a circular economy by demonstrating new approaches to nutrient recovery from those types of biowaste streams.

Recovery of nutrients from biowaste is essential to sustaining our future food production while decreasing environmental impacts.

Goals

- This innovative business project showcases at five large-scale demonstration biogas plants a cascade of novel nutrient-recovery approaches and techniques, including their performance and business model.
- The options of the techniques and the lessons learned will be evaluated at another ten European biogas plants.
- Policy advice to overcome innovation barriers and advance the Circular Economy in Europe will be provided.

Treatment of biowaste

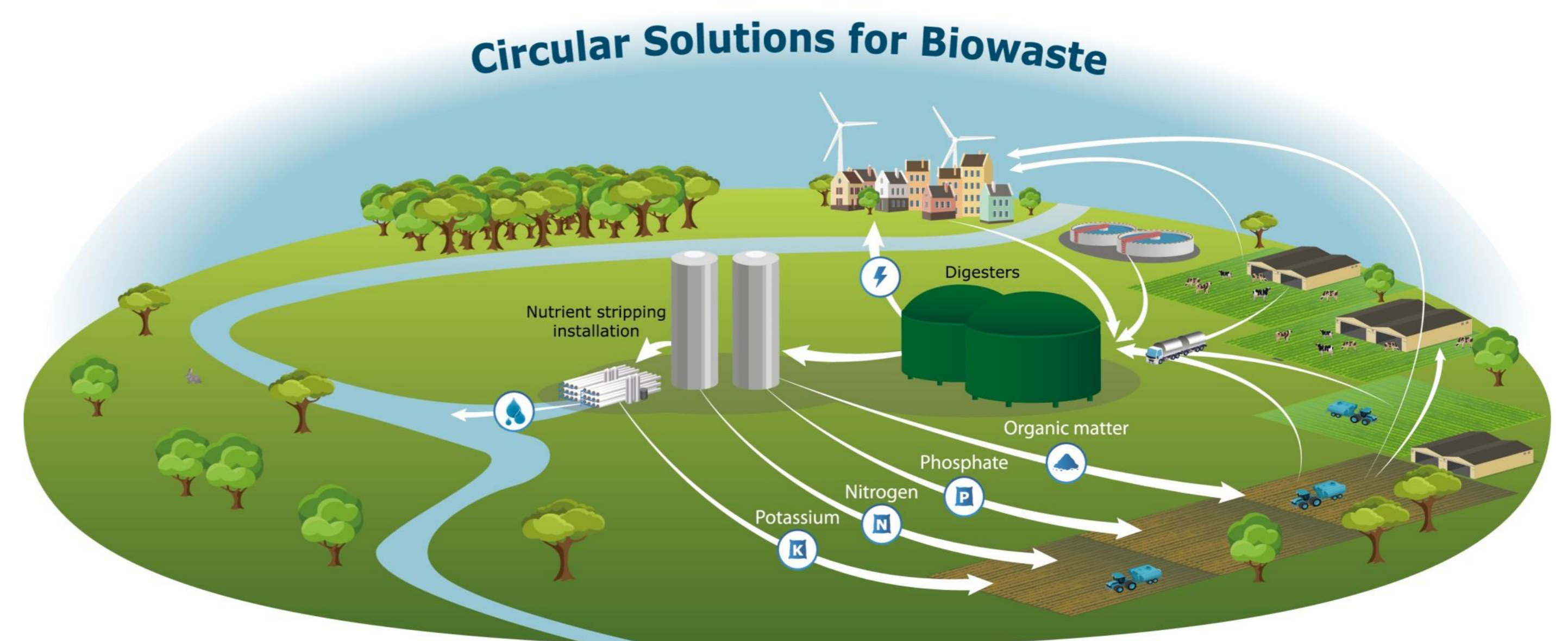
- Within the Circular Economy, biowaste is a source of energy, organic matter and nutrients, e.g. nitrogen (N), phosphorus (P) and potassium (K).
- The recovered nutrients can be used either as a direct substitute of fertilisers, or as a resource for the production of mineral fertilisers.
- The remaining organic matter with a reduced mineral content is a valuable soil improver that can be applied in the local region.
- This treatment approach of biowaste will:
 - reduce the energy consumption and CO₂ emissions associated with synthetic nitrogen production;
 - reduce Europe's dependency on external and finite phosphate reserves;
 - reduce CO₂ emissions of biowaste transport and reduce the nutrient losses to water and air due to the increased the nutrient utilisation.

Demonstration plants

Name	Capacity and main feedstock	Products
Groot Zevent Vergisting, the Netherlands	100,000 t pig slurry	Biogas, ammonium sulphate, (N/) K-concentrates, calcium phosphate, organic soil improvers
AM-Power, Belgium	180,000 t food waste	Biogas, N, K-concentrates organic fertiliser
Acqua e Sole, Italy	120,000 t sewage sludge	Biogas, ammonium sulphate organic fertilisers
Fridays, the UK	57,500 t poultry litter	Biomethane for grid injection, 500kw renewable electricity, ammonium sulphate, organic fertiliser
Benas (GNS), Germany	80,000 t corn silage, poultry litter	Biogas, Ammonium sulphate calcium carbonate, organic fertiliser, cellulosic fibres

Towards a circular economy

- Existing biogas plants will be enhanced with novel nutrient-recovery technologies. These pioneering plants play a pivotal role in the evaluation of the performance of our new circular solutions.
- The composition and quality of the products will be tuned to meet the requirements of regional markets. This market-driven approach is needed to develop a viable and sustainable industry.



SYSTEMIC large-scale, eco-innovation approach

leading pioneers

(five demonstration plants in their local contexts)

working on novel Nutrient Recovery & Re-use (NRR) techniques

first followers

(ten outreach plants in additional regions)

gaining business opportunities

- Advance the Technology Readiness Level (TRL) from pilot scale to full scale plant
- Showcase the technology & business case



- Regional market survey
- Nutrient-recovery strategies
- Co-creation into new businesses options

Dissemination & Policy advice

Expected results and impacts

- Substantially improve efficient resource use in Europe, contributing to significant reduction of adverse environmental impacts;
- Create new business opportunities for industry and SMEs in the EU, including in manufacturing in the global market for eco-innovative solutions;
- Demonstrate the economic, social, and environmental sustainability of the proposed approaches and main elements that a business plan should include in order to realise them, including an assessment of possible positive and negative side-effects and risks;
- Provide evidence-based knowledge for enabling framework conditions (such as the regulatory or policy framework) that facilitate a broader transition to the Circular Economy in the EU.



SYSTEMIC receives funding from the European Union's Horizon 2020 Framework Programme for Research and Innovation under Grant Agreement no. 730400.